

## **The Unnatural Flow Regime: Effects of Hydrologic Modification on Water Quality in Southeast Idaho**

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Many rivers in southeast Idaho have been harnessed for irrigation and electricity. Flow regimes have been altered, changing various aspects of hydrographs including timing and magnitude of both peak and base flows, affecting water quality. We compared water quality in a relatively unaltered river (Blackfoot) to other rivers with significantly altered hydrographs. Even in the unregulated system, temperature and dissolved oxygen problems are correlated with water quantity and are more common during low water years.

In another river heavily diverted for irrigation (Portneuf), lowered summer base flows increase the frequency of temperature and dissolved oxygen exceedances. In other cases, flow augmentation also can impact water quality. The Bear River is diverted into Bear Lake for storage. During irrigation season, Bear Lake water is pumped into the Outlet Canal, eventually joining the existing river channel downstream. Delivery of this water through an earthen canal entrains sediment, resulting in total suspended sediment values exceeding total maximum daily load targets. Unlike rivers that experience degraded water quality as a result of reduced water quantity, this river experiences degraded water quality as a result of flow augmentation.

In another scenario (American Falls Reservoir), excessive sediment is mobilized to the water column during low reservoir conditions when high winds entrain bottom sediment. This turbid water flows to the Snake River, degrading water quality there too. Each system impacted by hydrologic modification has unique circumstances that influence water quality. Hydrologic modification combined with effects of nonpoint and point source pollution often results in non-attainment of water quality standards and total maximum daily load targets. These factors should be considered when determining water body status, load targets and implementation plans.